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for Cosmological Physics
AT THE UNIVERSITY OF CHICAGO

Guaranteed Unresolved Point Source Emission and the Gamma-ray Background

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UnID Sources & Diffuse Emission

- Classes of established extragalactic gamma-ray emitters:
 - ① blazars
 - ② normal galaxies
 - ③ ? (extragalactic unidentified sources)
- As with blazars and normal galaxies, *some* contribution from unIDs to the diffuse background is guaranteed:
 - Similar unresolved extragalactic objects contribute to EGRB
 - Most numerous sources
- However: uncertainties!



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Our approach: is it OK to sweep UnID EGRB under the rug?

We seek to answer 2 questions:

1. How plausible is that *extragalactic* unresolved unIDs, have an insignificant contribution to gamma-ray background?
(use **numbers/fluxes** to answer this question)
2. Would collective unresolved emission from unIDs be spectrally consistent with the gamma-ray background?
(use **spectral indices** to answer this question)



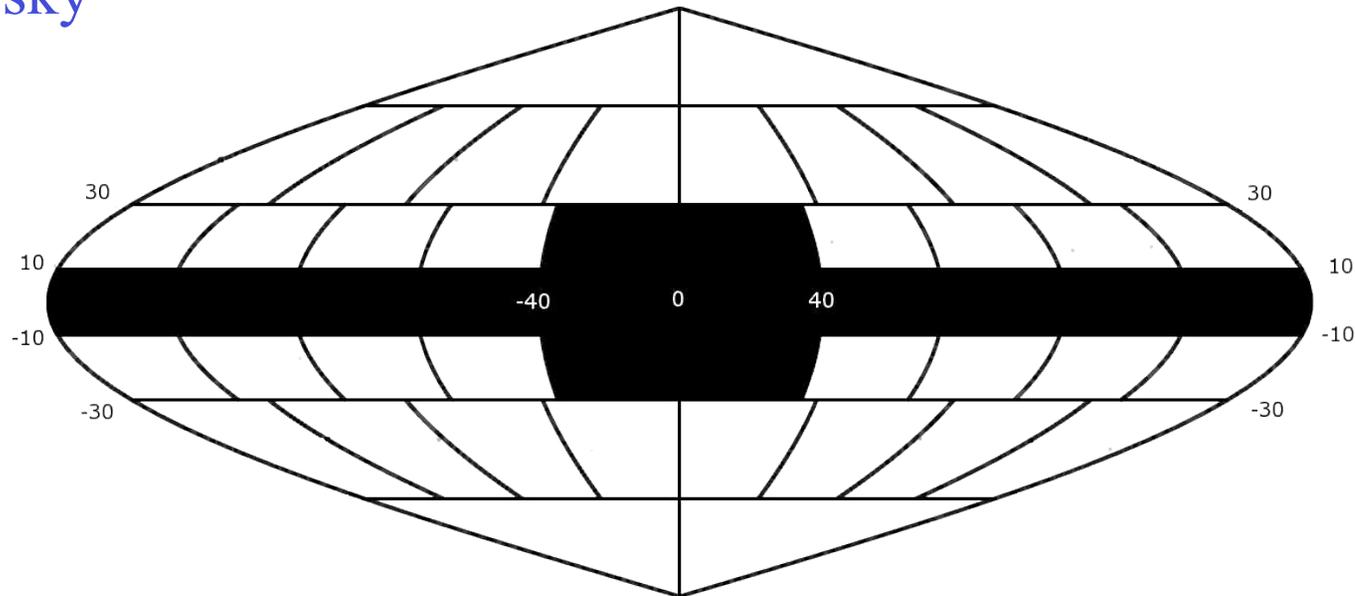
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Which resolved sources?

1. Exclude sources which are likely to be Galactic based on location on the sky



2. Try analysis with 3 different samples (from “generous” to “conservative”) to test sensitivity of results
 - a) all sources with no 3EG ID + all “maybe blazars”
 - b) all sources with no 3EG ID
 - c) all sources with neither 3EG ID nor later proposed possible ID

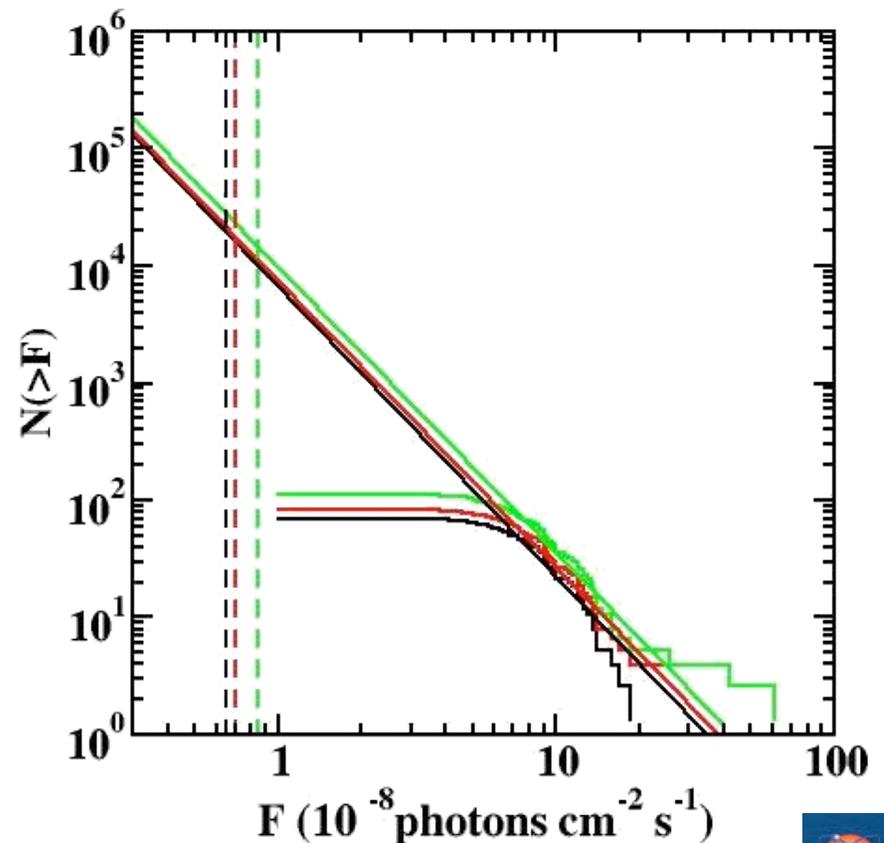




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Is a significant unID EGRB component far-fetched?

- Fit a power-law to cumulative flux distribution of resolved unIDs
- How far can I extrapolate to lower fluxes before EGRET EGRB is exceeded?



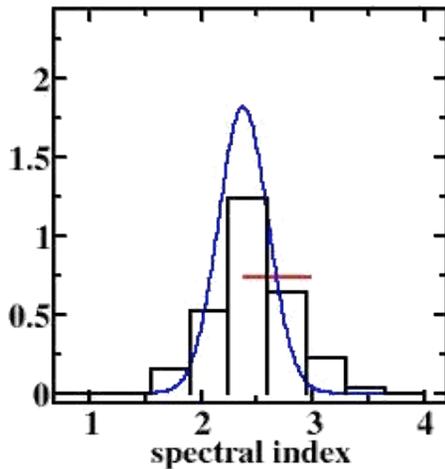
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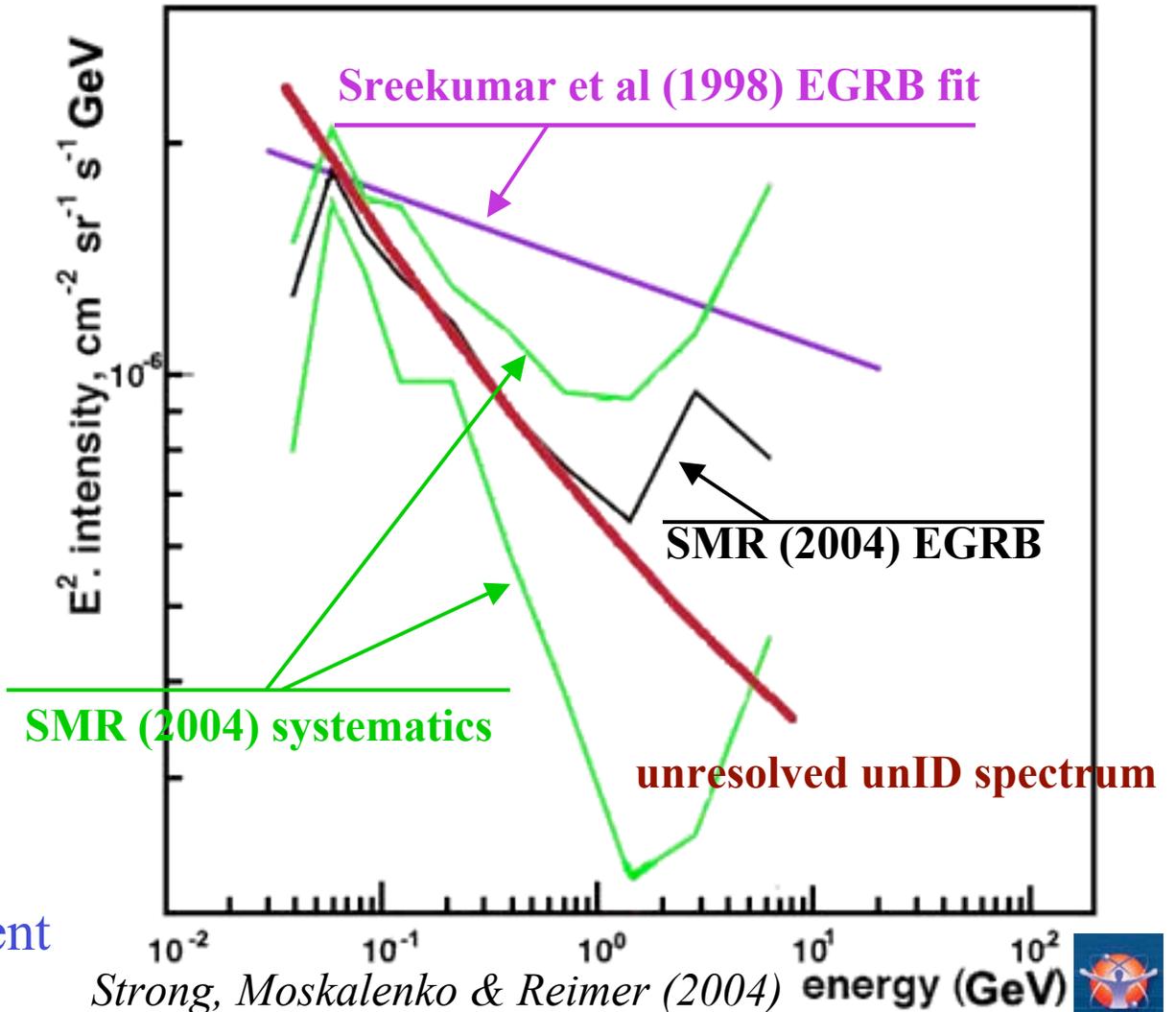
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How would the unresolved unID spectrum compare to that of the EGRB?

Calculate unresolved emission spectrum by assuming spectral index distribution of unresolved objects same as that of resolved objects



Careful! measurement errors important



Strong, Moskalenko & Reimer (2004)



Conclusions

- Contribution of unresolved unIDs to diffuse emission guaranteed, likely to be important:
 - If ... gh to
 - a
 - If ... ces,
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 - u
- Hint ...
- Future directions: GLAST + specific models of unID unresolved emission

We can never hope to adequately understand the origin of the extragalactic diffuse emission without at least *some* understanding of the nature of unidentified sources





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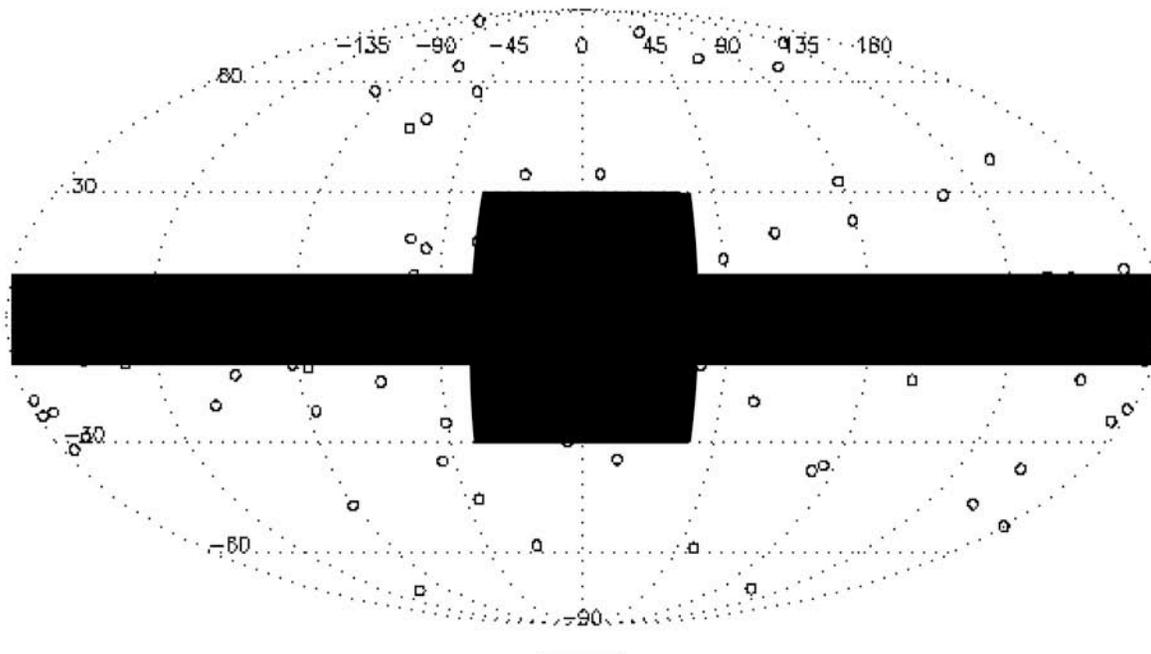


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Are most EGRET unIDed sources Galactic or extragalactic?

- Can isotropy help?

Still Unidentified 3EG Sources



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GLAST!

- Whatever the nature of the EGRET unIDs, GLAST will resolve many more
 - if unresolved unIDs currently responsible for considerable fraction of EGRB:
 - ⇒ associated reduction of GLAST EGRB
 - If unresolved unIDs currently responsible for considerable fraction of Galactic diffuse emission:
 - ⇒ associated reduction of GLAST diffuse MW (GeV excess affected?)



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Future directions

- Simple empirical model \Rightarrow unresolved unIDs have potentially significant contribution to diffuse emission, with good spectra agreement.
- Worth pursuing more detailed (but also more uncertain) models:
 - What if most of them AGN?
 - What if most of them associated with cosmic structure?
 - What if most of them Galactic?



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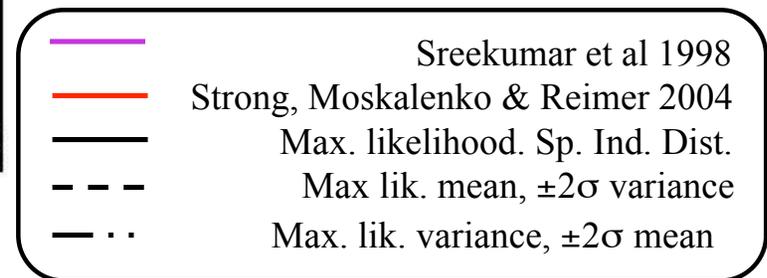
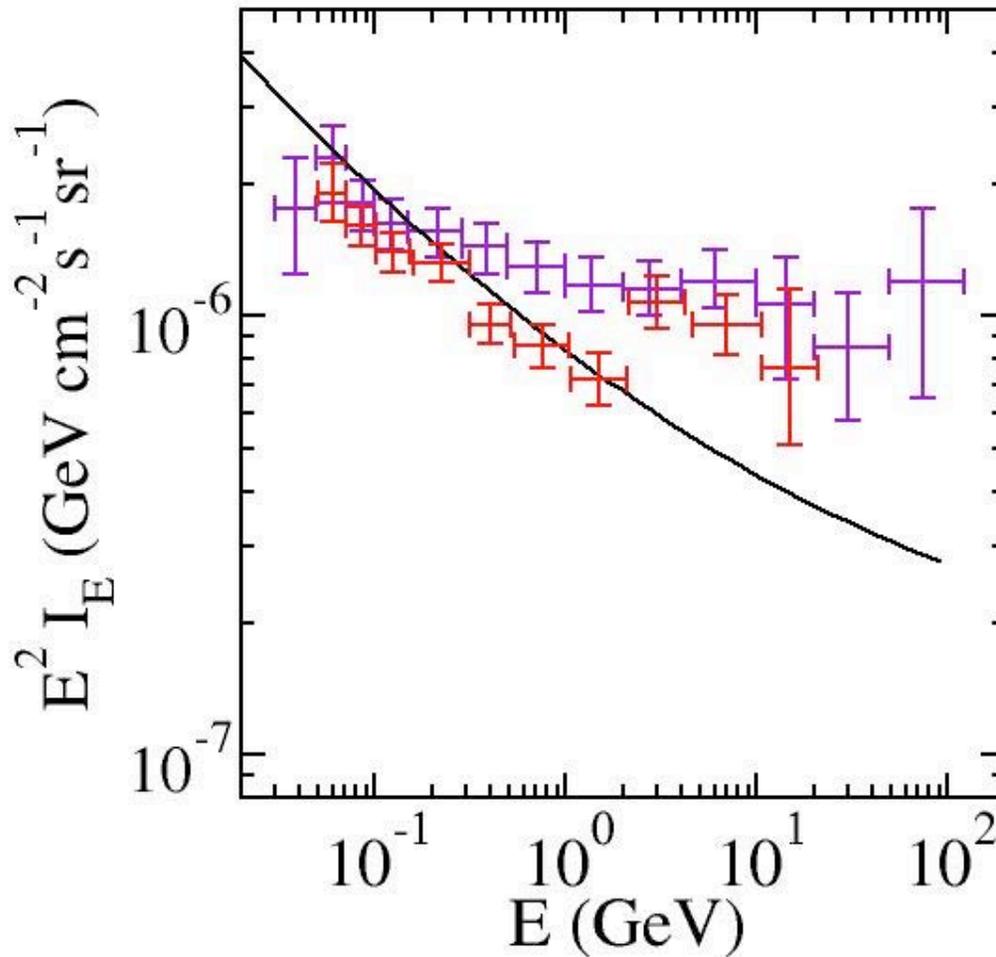


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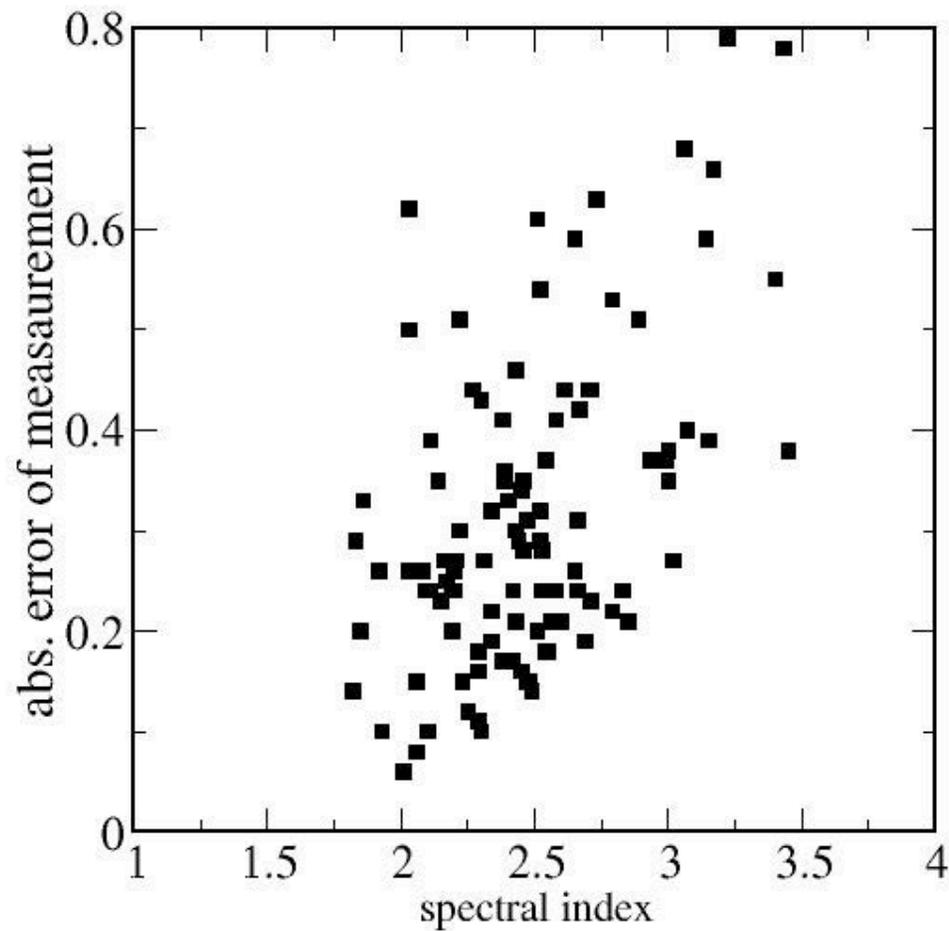
Results





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Spectral Indices & Errors of Measurements



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